REMARKS/ARGUMENTS

Applicant thanks the Examiner for withdrawing the finality of the previous Office action. Claims 1 and 4–30 are pending in the above-captioned application. Claims 1, 4–10, and 15–30 stand rejected, and claims 11–14 are objected to. With this paper, claims 23 and 24 are amended and claims 18–22 and 29 are canceled. No new matter was added with the amendment.

I. Claim rejections under 35 U.S.C. § 102(b) as being anticipated by Brand (US 5866442)

Claims 1, 9–10, 15–18, and 20–23 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Brand (US 5866442). This rejection is respectfully traversed. "[F]or anticipation under 35 U.S.C. § 102, a single reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present." MPEP § 706.02. "The identical invention must be shown in as complete detail as is contained in the . . . claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, USPQ2d 1913, 1920 (Fed. Cir. 1989).

With regard to previously presented claim 1, at a minimum, Brand does not teach introducing a gas or fluid into a vacuum chamber while a microfluidic device placed within the vacuum chamber remains under vacuum, or filling a microfluidic element of the microfluidic device with the gas or fluid. With regard to currently amended independent claim 23, Brand does not teach a detector configured to monitor filling of the microfluidic element with the gas or fluid. This limitation of the invention has been added to independent claim 23 to more particularly point out and distinctly claim Applicant's invention. Support for this limitation and the amendment to claim 24 can be found in original claim 29, which has been canceled with this paper, as well as on page 6, lines 13 and 14. Thus, no new matter has been added by the amendment of the claims.

The teachings of Brand relate to bonding a semiconductor device to a substrate. The utility of the apparatus taught by Brand is in filling gap 16 between semiconductor device 12 and substrate 14 with a fill material 60 "while minimizing voids, bubbles and non-uniform disposition of the fill material in the gap 16." *See* Figure 1 and column 5, lines 61–64. To accomplish this, device 12 and substrate 14 are assembled and placed on supports 64 located within the apparatus represented in Figure 1. These supports, when combined with engaging

seals 68 and substrate 14, form a barrier between an upper pressure chamber 80 connected to a pressure source and a lower vacuum chamber 66 connected to a vacuum source. Fill material 60 is positioned about the perimeter of gap 16 either before or after device 12 and substrate 14 are placed on supports 64. *See* column 7, lines 53–58. A pressure is then applied within pressure chamber 80 and a vacuum is applied within vacuum chamber 66, either simultaneously or sequentially, to "urge the fill material towards the interior 63 of the gap 16." *See* column 7, lines 59, through column 8, line 7.

The only structures taught by Brand that might be considered microfluidic elements are thermal vias 42, 44, 46, 48, 50, and 52 in substrate 14, which are described as having a diameter from about 0.001 inches to about 0.010 inches. When substrate 14 is placed in the apparatus taught by Brand, vias 42, 44, 46, 48, 50, and 52 face into vacuum chamber 66. *See* column 6, lines 17–21. Vacuum is applied to the interior 63 of gap 16 through the thermal vias to help distribute fill material 60 throughout gap 16. At no time is a gas or other fluid introduced into vacuum chamber 66. Further, the gas or other fluid introduced into pressure chamber 80 to apply pressure to fill material 60 remains within pressure chamber 80 and is prevented by engaging seals 68 from entering vacuum chamber 66 and filling vias 42, 44, 46, 48, 50, and 52.

A detector capable of monitoring the filling of a microfluidic element of a microfluidic device with a gas or fluid cannot be inherently present in the apparatus of Brand because, as demonstrated above, Brand does not teach filling a microfluidic element with a gas or fluid. Brand does not teach a detector of any kind, stating that pressure and vacuum are applied to the semiconductor device assembly "for a **selected** period of time **determined by experimentation** for the selected fill material...." *See* column 8, lines 11–13, emphasis added.

Thus, Brand does not teach every aspect of the claimed invention either explicitly or impliedly, nor does the reference show the identical invention claimed by Applicant in as complete detail as is contained in claims 1 and 23. Withdrawal of the rejection of claims 1 and 23 under U.S.C. § 102(b) as being anticipated by Brand is, therefore, respectfully requested.

Claims 9–10 and 15–17 depend directly or indirectly from claim 1. Therefore, Applicant respectfully submits that these dependent claims are allowable for at least the same reasons as set forth herein with respect to amended independent claim 1. Withdrawal of the

rejection of dependent claims 9–10 and 15–17 under § 102(b) as being anticipated by Brand is also respectfully requested. As noted above, claims 18–22 have been canceled.

II. Claim rejections under 35 U.S.C. § 102(b) as being anticipated by Fugere (US 6119895)

Claims 1, 18, 23, and 29–30 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Fugere (US 6119895). This rejection is respectfully traversed.

With regard to previously presented claim 1, at a minimum, Fugere does not teach introducing a gas or fluid into a vacuum chamber while a microfluidic device remains under vacuum, introducing a gas or fluid into a vacuum chamber such that the microfluidic device under vacuum within the chamber is submerged in the gas or fluid, or filling a microfluidic element of the microfluidic device with the gas or fluid. With regard to currently amended independent claim 23, Fugere does not teach a detector configured to monitor filling of the microfluidic element with the gas or fluid.

The teachings of Fugere, like those of Brand, relate to bonding a semiconductor device to a substrate. Fugere is silent with regard to any structure (prior art or otherwise) that could be considered a microfluidic element. The only structure that is filled with a material is the gap between a flip chip integrated circuit (IC) and its substrate. The gap is not described as being microfluidic nor can one assume that it meets the definition of a microfluidic element provided by Applicant.

Even if the flip chip IC assembly were considered to be a microfluidic device, no gas or fluid is introduced into the vacuum chamber taught by Fugere while the IC assembly is under vacuum. The underfill material dispensed onto the IC assembly is already present within the vacuum chamber when the assembly is placed under vacuum. *See* column 5, lines 1 and 2: "the dispensing system contained within the vacuum chamber...." Further, the IC assembly is at no time submerged in the dispensed underfill material. *See* column 5, line 41, emphasis added: "Material is then dispensed **onto** the workpiece...."

A detector configured to monitor filling of a microfluidic element of a microfluidic device with a gas or fluid cannot be inherently present in the apparatus of Fugere because, as demonstrated above, Fugere does not teach filling a microfluidic element with a gas or fluid. The apparatus of Fugere does not include a detector of any kind. As material is

dispensed onto the IC assembly, the vacuum chamber is slowly vented to atmosphere, drawing the underfill material into the gap between the IC and its substrate. Once the chamber is fully vented, a pneumatic door can be opened and the finished IC assembly removed. *See* column 5, lines 42–44. No detector is needed for or associated with this process.

Thus, Fugere does not teach every aspect of the claimed invention either explicitly or impliedly or show the identical invention claimed by Applicant in as complete detail as is contained in claims 1 and 23. Withdrawal of the rejection of claims 1 and 23 under U.S.C. § 102(b) as being anticipated by Brand is, therefore, respectfully requested.

Claims 9–10 and 15–17 depend directly or indirectly from claim 1. Therefore, Applicant respectfully submits that these dependent claims are allowable for at least the same reasons as set forth herein with respect to amended independent claim 1. Withdrawal of the rejection of dependent claims 9–10 and 15–17 under § 102(b) as being anticipated by Brand is also respectfully requested. As previously noted, claims 18–22 have been canceled.

III. Claim rejections under 35 U.S.C. § 103(a) as being unpatentable over Brand (US 5866442)

Claims 4–8 and 25–28 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Brand (US 5866442). The rejection of these claims is respectfully traversed.

To warrant rejection under 35 U.S.C. § 103(a), all the claim limitations must be taught or suggested by the prior art. *See* MPEP § 2142. As has been demonstrated above, the Brand reference neither teaches nor suggests all of the limitations of Applicant's independent claims 1 and 23. Thus, claims 1 and 23 are nonobvious. Claims 4–8 depend directly from independent claim 1. Claims 25–28 depend directly from independent claim 23. Any claim depending from a nonobvious claim is also nonobvious. *See* MPEP § 2143.03 and *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, dependent claims 4–8 and 25–28 are nonobvious. Withdrawal of the rejection of these claims as being unpatentable over Brand is, therefore, respectfully requested.

Claim 19 was also rejected under 35 U.S.C. § 103(a) as being unpatentable over Brand (US 5866442). As previously discussed, claim 19 has been canceled.

IV. Allowable subject matter

Claims 11–14 were objected to as being dependent upon a rejected base claim but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 11–14 depend indirectly from claim 1, which, as demonstrated above, is allowable over the cited references. Therefore, claims 11–14 depend from an allowable claim and so are, themselves, allowable. Withdrawal of the objection to claims 11–14 is respectfully requested.

Conclusion

For the foregoing reasons, Applicant believes all the pending claims are in condition for allowance and should be passed to issue. If the Examiner feels that a telephone conference would in any way expedite the prosecution of the application, please do not hesitate to call the undersigned attorney.

Respectfully submitted,

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I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on May 25, 2006 by Debra B. Burns.

Signed: Debra B. Burns